SPECIAL SPECIFICATION

SECTION 15491S

GAS VALVE MANIFOLD BOX / ISOLATION VALVE BOX

PART 1 - GENERAL

1.1 SECTION INCLUDES

1. Valve manifold boxes (VMB) for High Pressure Hydrogen and Low Pressure Hydrogen.
2. Isolation valve boxes (VB) for High Pressure Hydrogen and Low Pressure Hydrogen.
3. Purifier and Filtration box for High Pressure Hydrogen.
4. Hook up of valve manifold boxes, isolation valve boxes and purification and filtration box to exhaust**, power supply** and **nitrogen**.

1.2 REFERENCES/PROJECT REQUIREMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Requirements of the following Project Specification Sections apply to this section:
   1. Section 13085-S – Seismic Protection
   2. Section 15050-S – **Basic Mechanical Materials and Methods**
   3. Section 15481 Ultra High Purity Gas Distribution System
   4. Section 16001-S Electrical Work
   5. **ASME Section IX**
   6. **OSHA 29 CFR 1910, subparts S and H**
   7. **NFPA 79 Electrical Safety for Industrial Machinery**
   8. **SEMI S2-93 Safety Guidelines for Semiconductor Manufacturing Equipment**
   9. **SEMI S8-95 Safety Guidelines for Ergonomics/Human Factors Engineering of Semiconductor Manufacturing**
   10. **15310 Automatic Sprinklers and Water Based Fire Protection Systems**

1.3 DEFINITIONS

A. not used

1.4 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Design and manufacture VMB/VB's to principles of ultraclean technology:
      a. Leak free.
      b. Particle free.
      c. Outgas free.
      d. Contamination free.
      e. Dead space free.

   2. Configure valve manifold boxes to accept one process line input and manifold to four **for high pressure hydrogen and** six **for low pressure hydrogen** process line outputs and one future extension output as per drawings.
   3. Design, construct, install, certify and functionally test VMB/VB's. Perform certification and functional test prior to shipment from the factory. System certification and functionality shall be also tested after installation on site.
   4. Each manifold branch line to be capable of **manual** isolation**, pneumatic isolation** and inert gas purge to a dedicated tool, without interruption to main supply line or other branches.
   5. Each valve manifold box shall be capable of operating with one or more process line outputs in place. **The PLC c**ontroller **of VMB will** adjust **hydrogen supply to** variable process line outputs **upon receiving tool demand**.
   6. Supplier to provide VMB's with 2N2 nitrogen supply, (85 psig maximum design pressure), for pneumatic controls. A 2N2 nitrogen valve will be available within 25 feet of VMB locations.
   7. Provide 30" stick space for each process line inside of VMBs for hook up.
   8. Purge and vent connections to process gas streams by using dead space free (DSF) branch valves or multivalve block assemblies.
   9. Minimize system internal volume by reserve stick space which using component welded stick methode, DSF branch valves, multivalve block assemblies, and microfit weld fittings.

1.5 SUBMITTALS

A. Submit the following in accordance with Conditions of Contract and Section 01340, Shop Drawings:
   1. Product data
   2. Coordination Drawings

B. Within 60 days after release of purchase order, submit two sets of following:
   1. List of materials in contact with process gas, including vent and purge lines.
   2. Electrical and/or pneumatic schematics.
   3. Mechanical and electrical drawings.
   4. Complete parts list including manufactures part and model numbers.
   5. Performance test methods and data.

E. The supplier shall provide at the completion of systems pipeline distribution design two (2) complete sets of the following documentation for approval before assembly:
   1. Complete installation and certification procedures.
   2. Complete design drawing package (plan and isometric).
   3. List of all materials that will contact the process gas.
   4. Complete parts list including manufactures part and model numbers.
   5. Test data report sample documentation.

F. Provide following documentation with shipment:
   1. Complete operational procedures and maintenance manuals.
   2. Recommended spare parts list.
   3. Detailed sequence of operation for Autopurge controls.
   4. All test data reports on performance requirements

G. The supplier shall provide at the completion of systems installation two (2) complete sets of the following documentation for the VMB systems, pipeline distribution systems, and control and monitoring systems:
   1. Complete test data reports.
   2. Complete as-built design drawing package (plan and isometric).
   3. Conceptual design for systems expansion.
   4. Complete systems operations and maintenance manuals.

E. **Submit letter of compliance to SEMI S2 criteria.**

1.6 QUALITY ASSURANCE

A. Refer to Section 15481
B. Pressure test the High Pressure Hydrogen Distribution at 1.5 times 225 psig.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Purge VMB/VB's with UHP grade argon or nitrogen, pressurize to 20 psi, and seal with closed valve and metal fitting cap or plug before shipping.

B. Ship gas panel's double bagged in non permeable material, purged with inert gas, then sealed from atmosphere.

C. Ship keys for VMB/VB's directly to the **SDR**. Do not ship with VMB/VB.

1.8-1.15

A. not used

PART 2 – PRODUCTS

2.1-2.4

A. **Valve Manifold Box (VMB):**
   1. Stainless Design Concepts
   2. Norcimbus

2.5 EQUIPMENT

A. VMB/VB performance, material and component requirements shall meet the same specifications as for ultra High Purity Gas Distribution piping.

B. Valve Manifold Box (VMB)
   VMBs shall be configured as a minimum as follows:
   1. VMBs shall provide PLC or Microprocessor control.
   2. VMBs shall be capable of flow through purge gas flow from the tool to the purge valves on the isolation valve as well as from the VMB purge gas inlet to the tool.
   3. VMBs shall maintain a common spacing between the process inlet and process outlet sections to provide uniformity in accommodating "stick" componentry.
   4. VMBs shall provide mounting space for pressure transducer digital displays for each network (branch) in the manifold.
   5. VMBs shall provide a common shutdown push buttons controls for the entire manifold.
   6. VMBs shall provide a common electrical source connection with transformers as necessary to drive transducers and, automatic shutdown and controls.
   7. VMBs shall provide a common pneumatic "instrument air" source connection with internal manifolding provided as required.

C. Valve Box (VB)
   VB’s shall be configured as a minimum as follows:
   1. VB’s shall be capable of flow-through purge gas flow from the main to submain.

D. ENCLOSURES
   1. Provide a non-combustible enclosure for VMB's **and VB’s** used for hydrogen gas. VMB Access Windows: Non-combustible materials, self-closing.
   2. Equip VMB's and valve boxes with a door switch to allow the **FCS** system to indicate an alarm/warning when the enclosure is opened.
   3. Equip VMB's for hydrogen gases with a 175-degree F pendent type sprinkler head with threaded connection and cage guard. Fire protection provided by others.
   4. Seal VMB penetrations using rubber grommets, or approved alternative method.

J. EXHAUST AND INTAKE:

1. Design exhaust duct with one bulk fitting to accept gas detection sensor for hydrogen. Gas detection by others.
2. Exhaust airflow path to adequately scavenge gas from all regions within VMB and Valve Boxes.
3. Exhaust pressure availability: 1.0 inches WG maximum at cabinet connection.
4. Air inlet louvers: Provide with replaceable filters.
5. Supplier will be responsible for tapping into the exhaust submain, running exhaust duct to VMB and VB, installation of an isolating damper (at each VMB and VB), and connecting to VMB and VB.
6. Exhaust Flow Indication: Magnehelic Gauge is required at the exhaust of VMB and VBs.

K. CONTROLS

The controls and monitoring system shall control basic system monitoring and shutdown functions**.** Control routines shall be provided which are user software configurable within safety parameters.

1. Gas delivery controls systems shall be microprocessor or PLC based. PLC based systems shall include a "watchdog" timing circuit. PLC based systems preferred.
2. All signals to or within the system shall be fail safe. Fail-safe is defined as if power or pneumatic supply is lost, or if the microprocessor/PLC malfunctions. In such a state, all valves fail closed, the process gas flow stops, and the system sounds an alarm. Manual system reset is required.
3. The controls and monitoring systems shall provide for local and remote shutdown capability. The following conditions shall initiate a shutdown:
   3.1. Distribution system failures as defined through safety analysis.
   3.2. Manual local or remote Emergency Shut Off (ESO).
   3.3. Remote gas leak detection input **from the life safety system in the MERC room**.
   3.4. Remote exhaust failure input.
4. The controls and monitoring system shall provide a communications link (I/O functions) via RS 232C or RS 485 between the distribution system and remote monitoring and controls systems. The I/O shall be user configurable.
5. Electronics located within VMBs shall be capable of meeting the intrinsic safety requirements for areas classified as NEC Class 1 Division 2.
6. Critical alarms shall override the microprocessor or PLC regardless of status.
7. Two levels of security codes shall be provided to obtain access to the controls system. One security level shall be required to perform standard/routine procedures. A second security level shall be required to perform manual,

maintenance, or emergency operations, or to change any controls and monitoring parameters.

8. Built-in test programs and diagnostics shall be provided.

9. All system electronics shall include the following characteristics:

10.1. Functionally unaffected by Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI) in frequency ranges up to 350 MHz. at a distance of 2 feet.

10.2. Protected against electrostatic discharge.

10.3. Non-volatile memory.

10.4. 16 bit analog I/O resolution.

10.5. Capable of operation over a temperature range of 0 - 50 deg C.

10.6. Capable of operation over a relative humidity range of 0-95% (non-condensing).

11. All system electronics/electrical shall be uninterrupted by electrical micro-interruptions within the following ranges, i.e. the system shall remain on-line:

11.1. Voltage - +10 / -15 Volts

11.2. Frequency - + / - 0.5 Hz.

11.3. Rate of Change - 1.0 Hz/sec

L. ELECTRICAL

1. VMB's for **Hydrogen**: Conform to minimum NEC Class I Division 2 hazardous location requirements for internal components. State more stringent requirements if required to meet **I**BC/**I**FC codes.

M. LABELING

1. Label VMB**/VB** exterior enclosures with process gas system number and process tool information. Label internal piping per content and gas flow direction, including tool designator for valves and sticks.

2.6 COMPONENTS

A. Unless otherwise specified, all components shall meet or exceed the requirements described in section 15481.

2.7-2.11

A. not used

PART 3 – EXECUTION

3.1-3.4

A. not used

3.5 INSTALLATION

A. Provide VB's with two-valve isolation from hydrogen gas for any necessary operational procedures which involve opening or connecting gas line while VMB is in service.

B. Locate isolation valve on main supply header for each branch line.

C. Locate a purge valve immediately downstream of each branch isolation valve.

D. Locate a double isolation valve at end of gas supply header for main line QC, and connection to future gas lines.

E. Hookup 2N2 to VMB for any pneumatic control

F. Hookup electrical supply to VMBs.

3.6-3.15

A. not used

END OF SECTION 15491-S